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Replaced by Article 34

Patent Claims

1. Device (1) for separating impurities from the lubricating oil of an internal combustion engine, said device (1) comprising a filter element (2), wherein said filter element (2) is arranged in a two-piece housing (4) that is closed during operation of the device (1) and comprises a stationary lower housing part (42) and a removable upper screw cap (41), and wherein said screw cap (41) and said filter element (2) comprise detachable connection means (25, 45) which can be brought into contact and are used to transmit axial tractive forces, wherein the filter element (2) is removed from the housing (4) by means of these connection means (25, 45) when the screw cap (41) is rotated in its loosening rotational direction,  
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the connection means (25, 45) are connection means (25, 45) that can be brought into contact by rotating the screw cap (41) in its loosening rotational direction and can be disengaged by rotating the screw cap (41) in its tightening rotational direction.
2. Device according to Claim 1, characterized in that the angle of rotation covered by the screw cap (41) between the disengaged position and the engaged po-

sition of the connection means (25, 45) ranges from approximately 15 degrees to 30 degrees.

3. Device according to Claim 1 or 2, characterized in that the filter-element-side connection means (25) are formed by a concentric circle of snap-on hooks (24) that is anyway present at an upper end disk (22) of the filter element (2), and that the associated connection means (45) of the screw cap (41) are formed by a ring (46) with cam segments that is concentrically arranged at the bottom side of the upper part of said screw cap (41), wherein, in a first rotational position that can be adjusted by rotating the screw cap (41) in its tightening rotational direction, the circle of snap-on hooks (24) can be moved in axial direction into the ring (46) and out of the ring (46) with the cam segments in relation to each other and wherein, in a second rotational position that can be adjusted by rotating the screw cap (41) in its loosening rotational direction, the circle of snap-on hooks (24) that has been moved into the ring (46) cannot be moved out of the ring (46) with the cam segments in axial direction in relation to each other.
4. Device according to Claim 3, characterized in that the ring (46) with the cam segments is inserted in a recess (48) of the screw cap (41) as a separate component such that it can neither be rotated nor lost.
5. Device (1) for separating impurities from the lubricating oil of an internal combustion engine, wherein the device (1) comprises a filter element (2) at its bottom and, on top of said filter element (2), a centrifuge (3) with a rotor (31) drivable by means

of lubricating oil flowing through it, wherein said filter element (2) and said centrifuge (3) are arranged, one above the other, in a common two-piece housing (4) that is closed during operation of the device (1) and comprises a removable upper screw cap (41) and a stationary lower housing part (42), wherein a removable intermediate cap (5) is arranged in the housing (4) between said filter element (2) and said centrifuge (3), said intermediate cap (5) and said filter element (2) comprising first detachable connection means (23, 53) which can be brought into contact and are used to transmit axial tractive forces, and wherein said centrifuge (3), said intermediate cap (5) and said filter element (2) can be removed from the housing (4) while the latter is in its open state,

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- the screw cap (41) and the intermediate cap (5) additionally comprise second detachable connection means (44, 54) that can be brought into contact and are used to transmit axial tractive forces,
- the second connection means (44, 54) can be brought into contact by rotating the screw cap (41) in its loosening rotational direction in relation to the intermediate cap (5) and can be disengaged by rotating the screw cap (41) in its tightening rotational direction in relation to the intermediate cap (5), and
- the first connection means (23, 53) can, in relation to the filter element (2), be brought into contact by rotating the screw cap (41) in its loosening rotational direction, said screw cap (41) taking along the intermediate cap (5), and can, in relation to the filter element (2), be

disengaged by rotating the intermediate cap (5) in opposite direction.

6. Device according to Claim 5, characterized in that the angle of rotation covered by the screw cap (41) between the disengaged position and the engaged position of the first and second connection means (23, 53; 44, 54) in relation to the filter element (2) is, altogether, ranging from approximately 45 degrees to 120 degrees.
7. Device according to Claim 5 or 6, characterized in that the intermediate cap (5) has the shape of a bell and comprises at its outer perimeter axially extending fins (56) each of which is provided with at least one broadening (54) or aperture pointing in circumferential direction, and that the screw cap (41) comprises at its lower edge hooks (44) or noses that are pointing in its loosening rotational direction (41') and can be brought into contact with the broadenings (54) or apertures by rotating the screw cap (41) in its loosening rotational direction (41') in relation to the intermediate cap (5) and can be disengaged by rotating the screw cap (41) in its tightening rotational direction (41'') in relation to the intermediate cap (5).
8. Device according to Claim 7, characterized in that the fins (56) that comprise the broadenings (54) or apertures are, at the same time, used as stabilization and force diverting fins for reinforcing the intermediate cap (5) and for diverting onto the screw cap (41) such forces that are caused by an oil pressure below the intermediate cap (5) in the interior region of the housing (4).

9. Device according to Claim 7 or 8, characterized in that the broadenings (54) or apertures on the one hand and/or the hooks (44) or noses on the other hand are each provided with a slope or step (47, 57) at their surfaces that are brought into contact, said slope or step (47, 57) securing the engaged position.
10. Device according to Claim 5 or 6, characterized in that the intermediate cap (5) has the shape of a bell and comprises, in a radially outer region of its upper side, several wings (56') that are pointing in an axially upward direction, are spaced apart from each other in circumferential direction and are each provided with at least one broadening or aperture pointing in circumferential direction or with a depression used as connection means (54) and recessing in a radially inward direction and that the screw cap (41) comprises at its lower edge hooks or noses as connection means (44) that are pointing in the loosening rotational direction (41') of the screw cap (41) or in a radially inward direction, wherein said connection means (44) can be brought into contact with the connection means (54) of the intermediate cap (5) by rotating the screw cap (41) in its loosening rotational direction (41') in relation to the intermediate cap (5) and can be disengaged by rotating the screw cap (41) in its tightening rotational direction (41'') in relation to the intermediate cap (5).
11. Device according to Claim 10, characterized in that the second connection means (44, 54) are arranged and designed such that they overlap each other in

axial direction when the screw cap (41) is placed onto the stationary housing part (42) before the thread engagement thereof.

12. Device according to Claim 10 or 11, characterized in that the wings (56') comprise, at their radially outer end, a guide contour (58) fitting in the interior region of the screw cap (41) with motional play.
13. Device according to anyone of Claims 10 through 12, characterized in that a step (59) is provided at or next to each of the wings (56'), said step (59) projecting in a radially outward direction and forming the basis on which the lower edge (49) of the screw cap (41) is supported when the latter is in the tightened state.
14. Device according to anyone of Claims 10 through 13, characterized in that the wings (57) are connected to each other via a continuous circumferential collar or are joined to form a continuous circumferential collar.
15. Device according to anyone of Claims 5 through 14, characterized in that the filter-element-side connection means (23) are formed by a concentric circle of snap-on hooks (24) that is anyway present at an upper end disk (22) of the filter element (2) and that the associated connection means (53) of the intermediate cap (5) are formed by a ring (53) with cam segments that is concentrically arranged at the bottom side of the upper part (50) of said intermediate cap (5), wherein, in a first rotational position that can be adjusted by rotating in tightening

rotational direction, the circle of snap-on hooks (24) can be moved in axial direction into the ring (53) and out of the ring (53) with the cam segments in relation to each other and wherein, in a second rotational position that can be adjusted by rotating in loosening rotational direction, the circle of snap-on hooks (24) that has been moved into the ring (53) cannot be moved out of the ring (53) with the cam segments in axial direction in relation to each other.

16. Device according to Claim 15, characterized in that the ring (53) with the cam segments is inserted in a recess (52) of the intermediate cap (5) as a separate component such that it can neither be rotated nor lost.
17. Device according to anyone of the preceding claims, characterized in that the connection means (25, 45; 23, 53; 44, 54) are designed in the form of a bayonet lock or as a short-length thread.
18. Device according to anyone of the preceding claims, characterized in that the screw cap (41), the upper end disk (22) of the filter element (2) as well as the intermediate cap (5) if necessary and, if need be, the ring (46, 53) with the cam segments are each single-piece injection-molded parts of plastic.
19. Device according to Claim 3 or 15, characterized in that the screw cap (41) including its ring (46) with the cam segments or the intermediate cap (5) including its ring (53) with the cam segments is each a single-piece injection-molded part of plastic.